Effects of Memantine on Sign-tracking

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Introduction

- Sign-tracking is when an animal approaches and interacts with a *conditioned stimulus (*CS; in this case a retractable lever) signaling a forthcoming appetitive *unconditioned stimulus* (US; in this case a banana sucrose pellet) in classical conditioning.
- Sign-tracking occurs in humans. An example of this is a recovering addict automatically approaching and interacting with drug paraphernalia or other drug-related stimulus. This can often trigger relapse.
- Memantine is an NMDA receptor antagonist with effects on serotonin, dopamine, as well acetylcholine, usually used in treatment of Alzheimer's disease. We hypothesized that it would be effective in reducing sign-tracking.

Methods

Over the course of 5 days the rats were conditioned in a skinner box to associate a lever extended from a wall out with the delivery of a banana pellet in a food receptacle. During this we kept track of how they interacted with the lever and food receptacle to determine if they were sign-trackers, goal-trackers, or intermediates using the criteria of Meyer et al. (2012). Sign-trackers interacted primarily with the lever. Goal-trackers primarily interacted with the food receptacle. Intermediates interacted with both at similar rates. Next, we administered Saline, 5 mg/kg Memantine and 10mg/kg Memantine over three trials in a random order (using a Latin square design) with a 48 hour interval between each trial. During these trials we measured head entries into the food receptacle and lever presses.

Discussion

We did not find the hypothesized reduction in sign-tracking. Part of the problem may have been our sample, which consisted of a larger portion of goal-trackers and intermediates and fewer sign-trackers than usual; this is meaningful because it was the sign-trackers who showed the most dramatic reductions in sign-tracking with memantine administration. Currently we are planning to add additional data with the hopes of reaching a statistically significant result.

Acknowledgements:

We would like to thank Winona State University for providing funding for this project through the Winona State University Foundation (Project 251.0312) and the Office of Continuing Education and Development revenue sharing program.

Results

A mixed model ANOVA showed there was no significant main effect of Dose, $F(4,46)= 2.89$, $p=0.066$, partial $\eta^2=0.112$; there was a significant main effect of behavioral phenotype, $F(2,23)=5.11$, $p=0.015$, partial $\eta^2=0.308$. There is a significant interaction between dose and behavioral phenotype, $F(2,46)=2.89$, $p=0.003$, partial $\eta^2=0.292$. Post hoc testing with Tukey's HSD showed no significant differences between pairs. However, the he difference between saline and the 10 mg/kg in the intermediate group was almost significant, $t(23)=3.308$, $p=0.062$.